Needs in Software Development

A NIST Perspective

Steve Ray, Ph.D.
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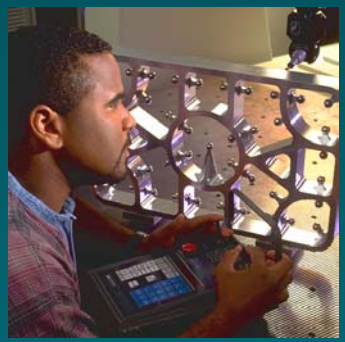
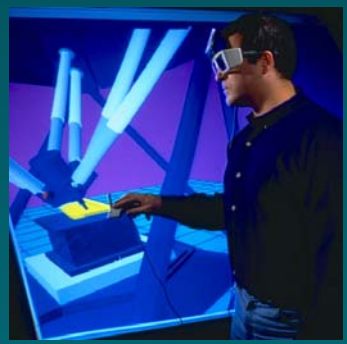

Commerce in the U.S. Depends on Software

- What are the principal problems?
  - Security
  - Privacy
  - Reliability
  - Complexity
  - Interoperability

Why pay attention to interoperability standards?

"The problem: today's wireless networks use a maze of incompatible transmission standards, so road warriors aren't guaranteed a dial tone when they travel. U.S. wireless operators alone use three competing standards"

"A confusing variety of DVD discs have been announced."

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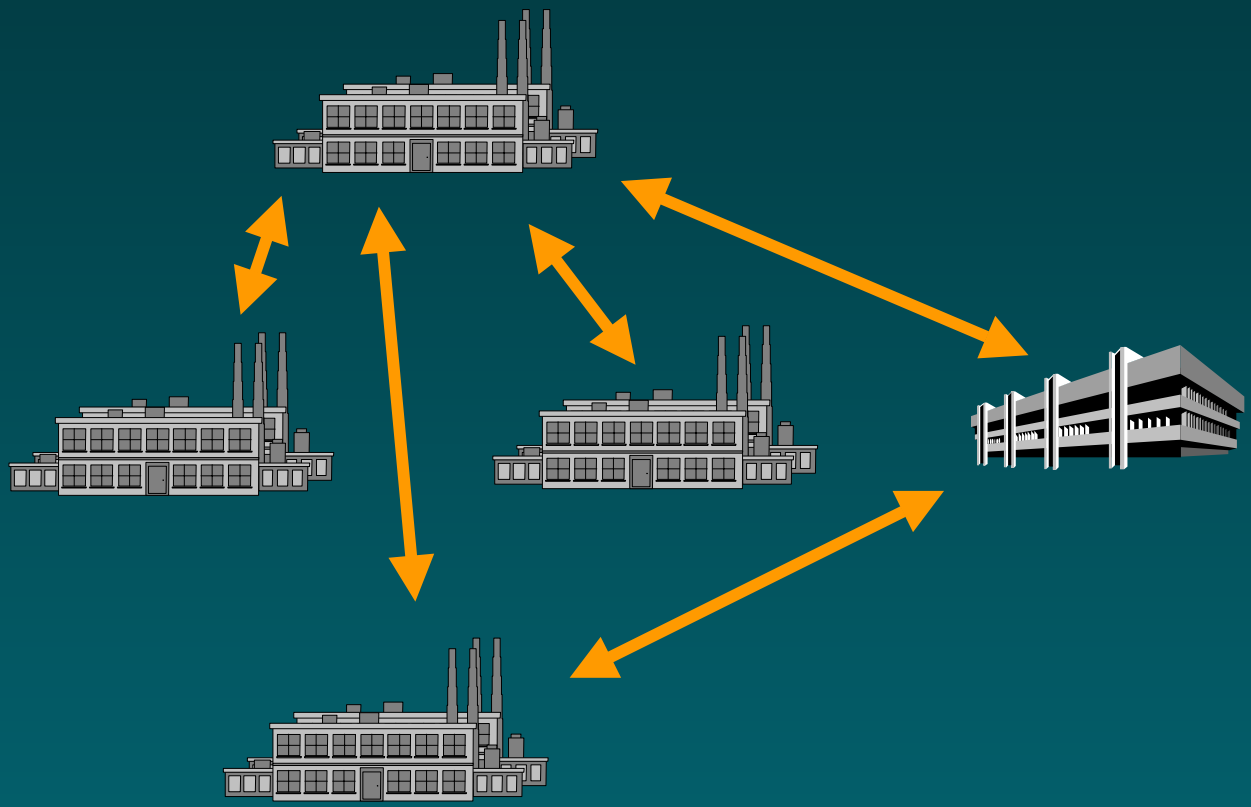
Lack of IT integration hurts chem/bio warfare defenses

By Dan Verton
(Oct. 08, 2001) Washington

A lack of interoperability among inventory management systems has made it impos
Department of Defense to guarantee the availability and effectiveness of its stock of

E-Manufacturing

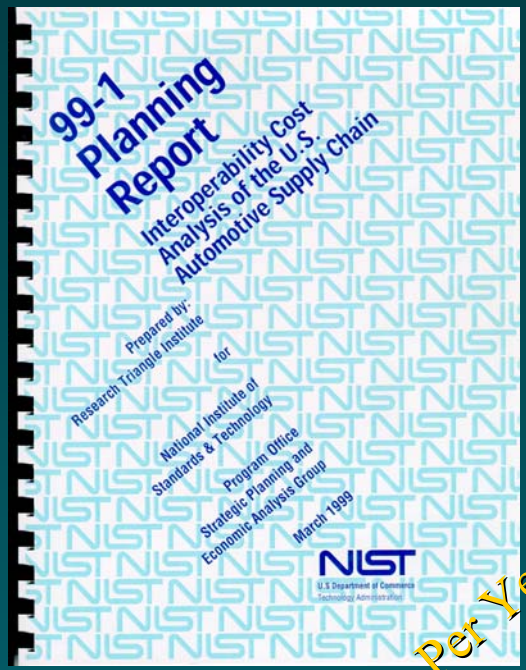


Interoperability among partners at Internet speed

E-Manufacturing Information

- Product data
- Manufacturing plans
- Material specifications
- Process specifications
- Analysis data
- Cost data
- Supplier information
- Inventory management data
- Supplier delivery data
- Demand forecasts
- Production status
- Pricing information
- Warranty information
- Quality information
- Product genealogy
- ...

Automotive Interoperability Cost Study Results



What is the economic cost due to lack of interoperability in the automotive supply chain?

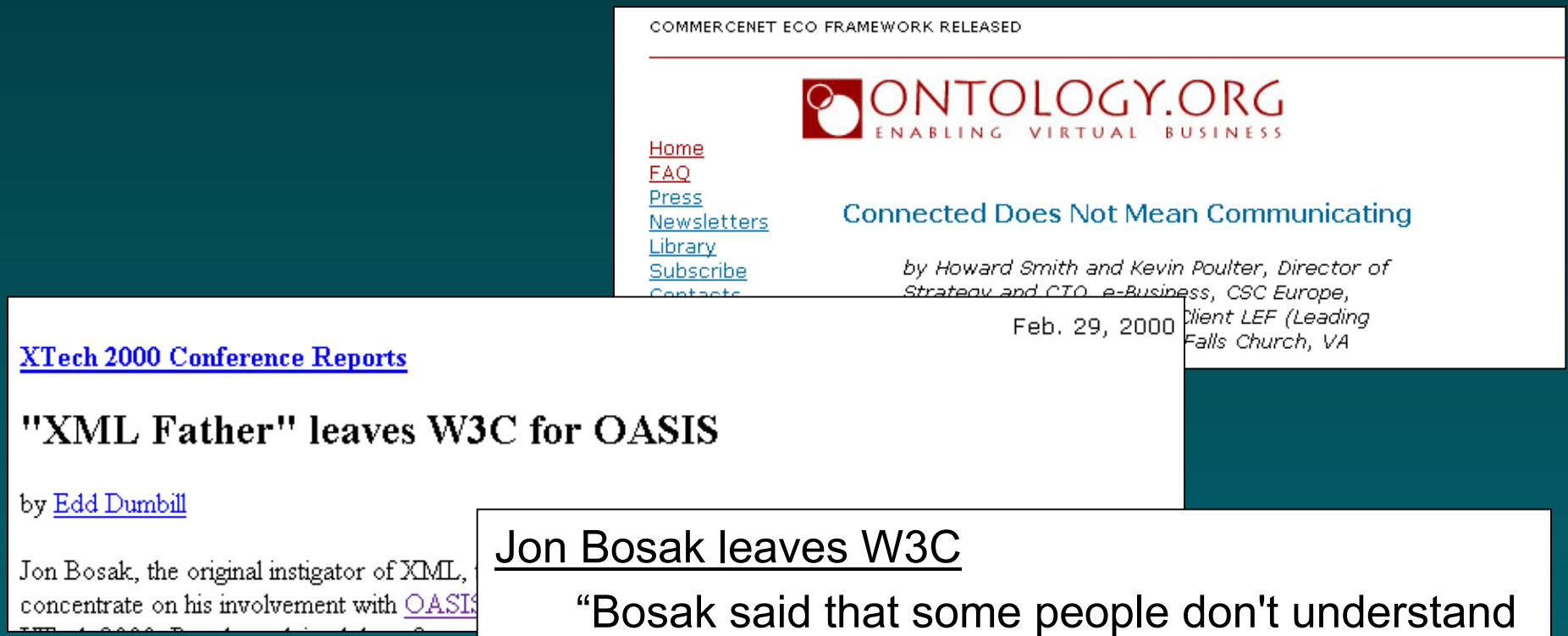
<u>One Billion Dollars Per Year!</u>

- Two survey approaches used with OEMs, Large Suppliers, and Tooling manufacturers
- Result is considered to be a conservative estimate
- <u>Fixing flaws in data exchanges is the primary cost driver</u>

"450,000 Data Exchanges Per Year"

"as much as 50% of their time dealing with poor data files"

Connectivity ≠ Interoperability



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Connected Does Not Mean Communicating

by Howard Smith and Kevin Poulter, Director of Strategy and CTO, e-Business, CSC Europe, Client LEF (Leading Falls Church, VA

Feb. 29, 2000

XTech 2000 Conference Reports

"XML Father" leaves W3C for OASIS

by Edd Dumbill

Jon Bosak, the original instigator of XML, concentrate on his involvement with OASIS

Jon Bosak leaves W3C

"Bosak said that some people don't understand that e-commerce applications require shared agreements about data exchange above and beyond the document interchange level."

Two Challenges

- Need for more rigor (less ambiguity) in exchange standards
- Rapid growth in the number and pace of standards needed

Representing standards

Old-style (most common) standards specifications: (e.g. ISO 14258, Requirements for enterprise-reference architectures and methodologies)

"3.6.1.1 Time representation

If an individual element of the enterprise system has to be traced then properties of time need to be modeled to describe short-term changes. If the property time is introduced in terms of duration, it provides the base to do further analyses (e.g., process time). There are two kinds of behavior description relative to time: static and dynamic."

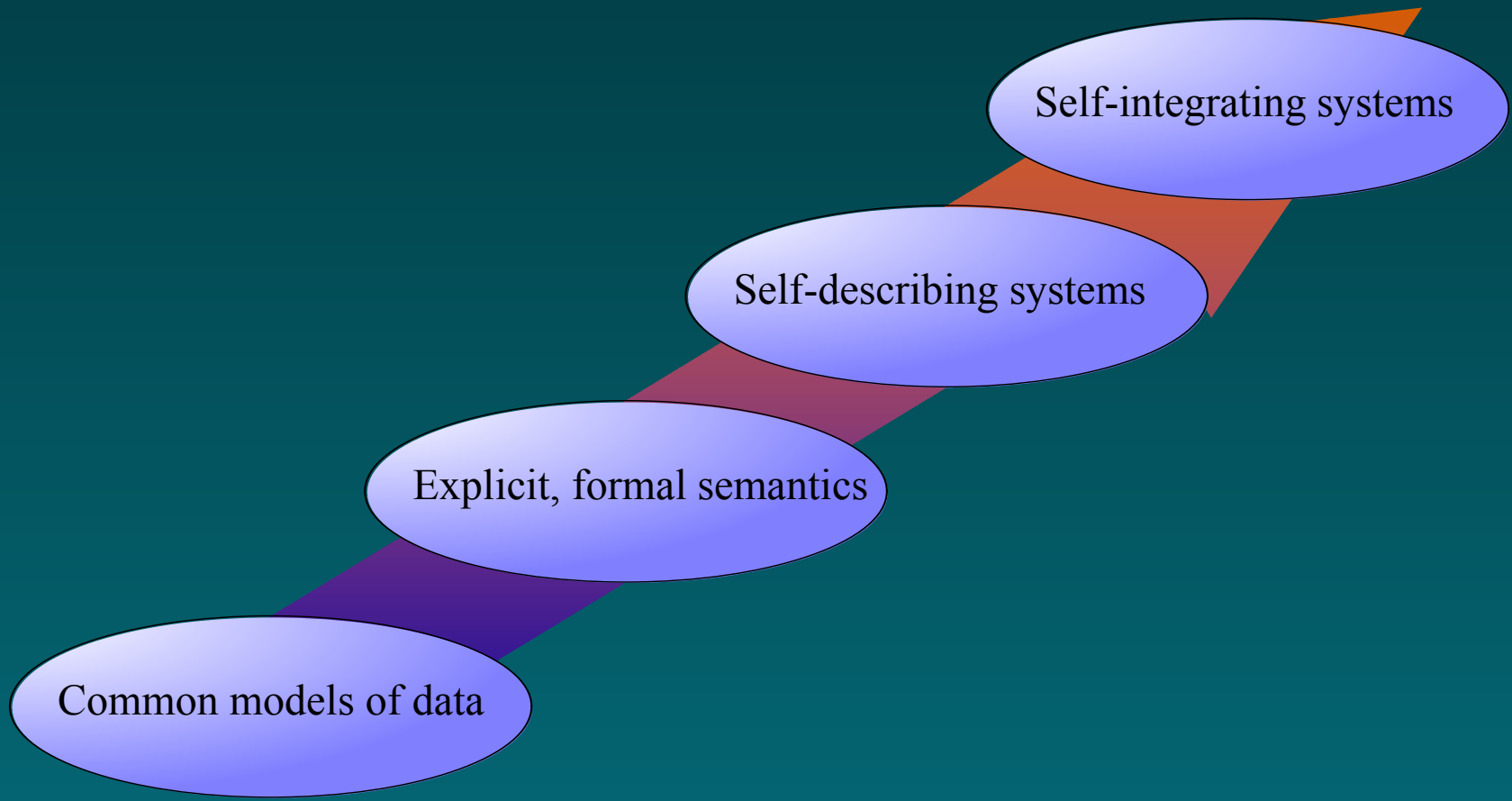
Data-model standards (e.g. ISO 10303-41, Product Description and Support)

```
ENTITY product_context
  SUBTYPE OF (application_context_element);
  discipline_type : label;
END_ENTITY;
```

Semantic-model standards (e.g. ISO 18629-11, PSL Core)

```
(forall (?t1 ?t2 ?t3)
      (=>    (and    (before ?t1 ?t2)
                     (before ?t2 ?t3))
             (before ?t1 ?t3)))
```

Evolution of Integrated Data Exchange



Technical Picture

- Interoperability continues to grow as a problem among increasingly IT-dependent systems
- Rigorous information exchange standards are becoming even more important
- Connectivity ≠ Communication
- Syntax ≠ Semantics
- A semantic approach offers a rigorous solution to the next generation of interoperability problems
- A semantic foundation also offers a way out of a race we can't win - trying to keep up with the pace of standards needs
- Software development explicitly addressing semantics will be needed

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